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CONSTRUCTION and EVALUATION of a KIT-FORM MICROWAVE OVEN

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A Heathkit[R] model GD-29 microwave oven was purchased and assembled in accordance with the manual supplied with the kit. As construction progressed, problem areas were observed and recorded. Most assembly problems were of a mechanical nature. After the oven was assembled, microwave leakage was observed to be less than 1 mW/cm^2. The possibility of hazards caused by errors in construction and wiring were investigated in the areas of door construction, interlock adjustments, and interlock wiring. The Heath microwave oven which was assembled will not comply with the performance standard for microwave ovens which will become effective October 6, 1971, primarily because objects can be inserted through the open screen in the door and the resulting leakage is in excess of 5 mW/cm^2. A list of recommended modifications is presented.

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BRH/DEP 71-7

CONSTRUCTION and EVALUATION of a KIT-FORM MICROWAVE OVEN

William Kanne, Jr.
Product Testing and Evaluation Branch
Division of Electronic Products

May 1971

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Bureau of Radiological Health
Rockville, Maryland 20852

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FOREWORD

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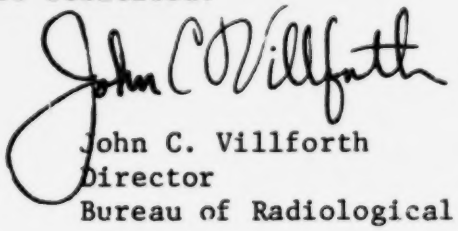
Within the Bureau, the Division of Electronic Products (1) develops and administers performance standards for radiation emissions from electronic products, (2) studies and evaluates emissions of and conditions of exposure to electronic product radiation and intense magnetic fields, (3) conducts or supports research, training, development, and inspections to control and minimize such hazards, and (4) tests and evaluates the effectiveness of procedures and techniques for minimizing such exposures.

The Bureau publishes its findings in appropriate scientific journals and technical report and technical note series for the Bureau's divisions, offices, and laboratories.

The technical reports and notes of the Division of Electronic Products allow comprehensive and rapid publishing of the results of intramural and contractor projects. The reports and notes are distributed to State and local radiological health program personnel, Bureau technical staff, Bureau advisory committee members, university radiation safety officers, libraries and information services, industry, hospitals, laboratories, schools, the press, and other interested individuals. They are also included in the collections of the Library of Congress and the National Technical Information Service.

I encourage the readers of these reports to inform the Bureau of any omissions or errors. Your additional comments or requests for further information are also solicited.



John C. Villforth
Director
Bureau of Radiological Health

PREFACE

The Department of Health, Education, and Welfare, under the authority of the Radiation Control for Health and Safety Act of 1968, has promulgated a performance standard for microwave ovens. The standard became effective on October 6, 1970, and will be applicable to microwave ovens manufactured after October 6, 1971. The Division of Electronic Products (DEP), Bureau of Radiological Health, participated in the development of this standard and is continuing an active program of purchasing microwave ovens, testing and evaluating them, and publishing the test procedures and results.

When a kit-form microwave oven became available to the public, it was decided that such an oven should be assembled with consideration given to possible exposure to the builder and tested to determine whether it will comply with the provisions of the performance standard. Hence, a Heathkit® model GD-29 oven was purchased from a Heath retail outlet and assembled in the laboratories of DEP. This report presents comments on the construction procedure, describes the test results, and lists modifications recommended to the manufacturer.

Robert L. Elder, Sc.D.
Director
Division of Electronic Products

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ABSTRACT

A Heathkit[R] model GD-29 microwave oven was purchased and assembled in accordance with the manual supplied with the kit. As construction progressed, problem areas were observed and recorded. Most assembly problems were of a mechanical nature. After the oven was assembled, microwave leakage was observed to be less than 1 mW/cm^2. The possibility of hazards caused by errors in construction and wiring were investigated in the areas of door construction, interlock adjustments, and interlock wiring. The oven which was assembled will not comply with the performance standard for microwave ovens which will become effective October 6, 1971, primarily because objects can be inserted through the open screen in the door and the resulting leakage is in excess of 5 mW/cm^2. (The Heath Company has recently designed a door baffle which prevents insertion of objects through the door screen.) A list of recommended modifications is presented.

CONSTRUCTION AND EVALUATION OF A KIT-FORM MICROWAVE OVEN

1. INTRODUCTION

In implementing the requirements of the Radiation Control for Health and Safety Act of 1968, the Department of Health, Education, and Welfare has published a performance standard for microwave ovens,[1] applicable to ovens manufactured after October 6, 1971. In gathering background material for the development of this standard, the Division of Electronic Products (DEP), Bureau of Radiological Health, has been following an active program of purchasing microwave ovens, testing them in its laboratory, and publishing test procedures and results.[2] When a kit-form microwave oven became available to the public, the Bureau deemed it necessary to construct one of these ovens in its laboratory, with careful consideration given to possible exposure to the builder. As a result of this decision, Heathkit® model GD-29 microwave oven was purchased from a local Heath products retail outlet and assembled in accordance with the instructions supplied with the kit. This report comments on the construction procedure and lists the modifications that have been recommended to the manufacturer.

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[1] FEDERAL REGISTER, Vol. 35, No. 194, pp. 15642-43

[2] SMITH, S.W., J.W. NICOLLS, R.L. MOORE, W.E. GUNDAKER, Laboratory testing and evaluation of microwave ovens, Report No. BRH/DEP 70-25, USDHEW, PHS, BRH, DEP (October 1970). (Available from National Technical Information Service, Springfield, Va. 22151. Accession No. PB 194 484. Price is $3.00 for paper copy and $0.95 for microfiche).

2. OVEN DESCRIPTION

The Heathkit model GD-29 microwave oven is a domestic countertop oven which is purchased in kit form and assembled by the prospective user. The oven operates at a frequency of 2450 MHz and has a power output of 650 watts. It requires 115 volts at 60 Hz and 15 amperes. A 20-ampere circuit breaker located on the bottom of the oven case protects the oven from electrical overloads.

The overall dimensions of the oven are 15-1/8 inches high, 25-1/2 inches wide, and 14-3/4 inches deep. The oven cavity is 7-5/16 inches high, 15-1/2 inches wide, 14 inches deep, and is constructed of stainless steel. The cavity contains a three-bladed "mode stirrer" which rotates at 65 rpm. A glass plate on which the food is placed is suspended about 2 inches above the floor of the cavity and permits reflected energy to heat the bottom of the food.

The oven incorporates a Litton Industries type L5401 magnetron tube; the maximum voltage available to the magnetron is 3.5 kV. The magnetron tube is coupled to a waveguide which transfers the microwave energy along the top of the cavity. Microwave energy enters the top of the oven cavity through slots in the waveguide.

The door is bottom hinged and consists of a Teflon-coated capacitive-seal plate and a conductive vinyl door seal. Ventilation is accomplished by drawing air in through the back of the oven case, passing it through the magnetron assembly for cooling and into the oven cavity, and then exhausting it through an open screen in the door.

The oven has two interlocks which prevent operation of the magnetron when the door is open. The primary interlock is of the latch type, which prevents any movement of the door before the interlock switch is opened. The latch is operated by a solenoid which is activated by a microswitch in the door handle. The second interlock switch is concealed and operates off the left door guide.

The control panel for the oven contains a minute timer, push-type on-off power button, and various indicator lamps. Indicator lamps are provided for "POWER ON", "HI TEMP" (magnetron overheating), "DOOR OPEN", and "COOK".

A schematic diagram of the oven is presented in figure 1.

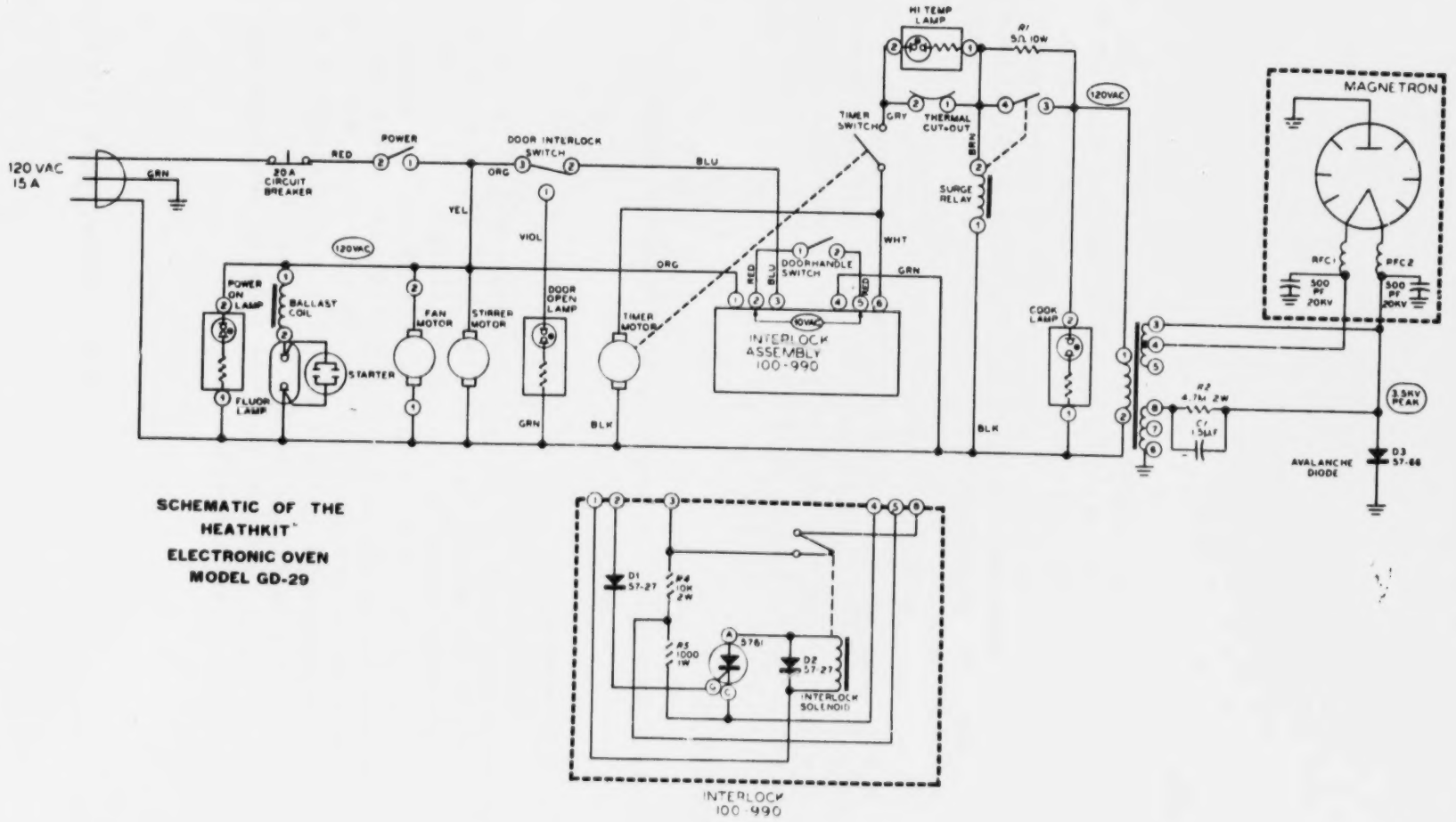

Figure 1. Schematic of Heathkit oven.

3. ASSEMBLY PROCEDURES

3.1 GENERAL COMMENTS

The purchased oven, a Heathkit model GD-29, was assembled in the laboratories of the Product Testing and Evaluation Branch of the Division of Electronic Products by following the instructions in the assembly manual[3] provided with the kit. Laboratory personnel judged that the manual is well-illustrated and provides adequate instructions for assembly of the oven. No technical errors in the text of the manual were noted.

About 60 percent of the actual assembly of this oven concerns the fitting of mechanical components rather than electrical wiring. Most problems associated with the construction of the oven were of a mechanical nature; e.g., screw holes not aligning properly.

3.2 DETAILED ASSEMBLY NOTES

All page numbers shown refer to pages in the Heathkit assembly manual.

(1) Page 10, Oven Assembly

The self-tapping screws used to install the oven cavity in the cabinet are very difficult to attach because they must tap through a double thickness of stainless steel on the cavity flange. It is important for the cavity to be located in the cabinet in such a manner as to provide a firm support on which the capacitive-seal plate can apply the pressure required to create an effective microwave door seal. For this reason, it is undesirable to omit any of the self-tapping screws after the builder tries unsuccessfully to tap into the cavity flange. Two holes in the cavity flange were not punched cleanly and required drilling before a screw could be inserted.

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[3] HEATHKIT® ASSEMBLY MANUAL, Electronic Oven Model GS-29, part 595-1262, 1970.

It would be more desirable to attach the cavity to the cabinet with bolts, nuts, and lockwashers, or by using machine screws and pre-tapped holes in the cavity flange. This would ensure that all the screws perform their function of locating the cavity in the cabinet and thus provide the firm support required for an effective door seal.

(2) Page 13, Alignment of the Front Panel Assembly

The builder is instructed to place the front panel on a "flat" surface and to use a ruler or straightedge to check for flatness of the assembly. This panel should be as flat as possible to provide a good capacitive seal with the Teflon-coated door plate. The front panel assembly furnished with the kit required bending to present a flat surface. Since the flatness of this panel has a direct effect on the amount of microwave leakage, it is recommended that the supplier of this panel check for flatness of the panel surface before it is supplied to the oven manufacturer for inclusion in the kit.

(3) Page 13, Installation of Front Panel Assembly to the Oven Chamber

The front panel assembly is attached to the cavity by means of screws which tap into one thickness of stainless steel. One thickness of stainless steel is so thin that the screws can be stripped with very little effort. There is a warning in the manual to this effect, but firmly tightening the screws will often strip the threads. Since the face of the front panel assembly forms one plate of the capacitive door seal, it is important that all the mounting screws hold it firmly to the cavity flange. Another method of attaching the front panel assembly to the cavity should be investigated.

(4) Page 14, Installation of the Door Hinge to the Front Panel

The holes in the front panel assembly and the holes in the sheet metal of the cabinet behind it did not align properly. All the mounting holes had to be redrilled before the hinge could be mounted.

(5) Page 17, Cutting Vinyl Door Seal

The dimensions of the portion of the vinyl door seal which must be removed to clear the hinge mounting bracket is shown at the bottom of page 17, detail 9A. The dimensions given in detail 9A are technically correct but do not show the actual length of the vinyl to be removed. A careless builder could remove a 4-1/2-inch length (the distance given to locate one end of the length to be removed), instead of the required 1-3/4-inch length. Removal of more vinyl than necessary could increase microwave leakage. The actual length to be removed should be shown in the illustration.

(6) Page 19, Placement of the Spacer Plates on the Door Studs

One of the longer spacer plates (Heath part no. 205-744) included in the kit did not have the holes punched along its length and would not fit over the door studs. It would be difficult for the average builder to drill the nine 1/4-inch holes in the spacer plate with the precise spacing required to fit over the door studs. These spacer plates support the capacitive-seal plate and are required for an effective door seal. Omitting a spacer plate will cause an increase in microwave leakage, as is discussed in detail in section 5 of this report.

The spacer plates can be mounted over the door studs with the wide edge of the spacer facing the vinyl door seal, resulting in a 1/2-inch space in the corners of the rectangle formed by the spacer plates. Microwave leakage with the spacers in this position was no greater than it was when the plates were correctly positioned.

(7) Page 50, Installation of Cabinet Side Panel

The three mounting holes toward the rear of the side panel did not align with the holes in the back panel of the cabinet. Drilling was required before this panel could be attached to the case.

4. LEAKAGE AND OPERATIONAL CHECKS OF ASSEMBLED OVEN

4.1 INTERLOCK OPERATION

The solenoid-operated interlock latch requires the oven power switch to be on before the door can be opened. The latch interlock does not allow any door movement until the main interlock switch is open. This interlock can be defeated by inserting a screwdriver or a rod through the slit in the front door panel and pushing on the striker plate. When the interlock has been defeated, the latch roller prevents the door hook latch from entering the interlock assembly, and the door will not close tightly. At this point the door is open about 1 inch at the top of the front panel. Since the secondary interlock on the left door guide opens the circuit when the door is opened 1/4 inch, the oven will not operate. Thus, defeating the primary interlock renders the oven inoperative, regardless of the door position, if the second concealed interlock is adjusted and functioning properly.

4.2 MICROWAVE LEAKAGE MEASUREMENTS

Microwave leakage measurements were performed on the assembled Heathkit oven in accordance with the requirements of paragraph 78.212(c)(2) of the performance standard for microwave ovens.[4] A standard 600-ml beaker containing 275 ml of water was placed in the center of the cooking shelf, and leakage radiation from the operating oven was measured with a Narda 8100 survey instrument at a distance of 5 cm.

(1) Microwave Leakage with Cabinet Removed

There is a high probability that an oven that is assembled by the user will occasionally be operated with the case removed. This is especially true if trouble shooting is done, because the case must be removed to measure voltages, etc. Hence, all external surfaces behind the door were surveyed with the Narda 8100 instrument. A maximum leakage of 0.4 mW/cm^2, was measured along the waveguide/cavity seam.

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[4] See footnote 1, page 1.

(2) Leakage through the Oven Case

The maximum leakage through the oven case, 0.08 mW/cm^2, occurred through the transformer vents in the rear of the oven.

(3) Door Seal Leakage

A maximum leakage of 0.07 mW/cm^2 was measured through the door seal at the lower left corner of the oven. No leakage was noted through the door screen.

(4) Leakage Around the Control Panel

A maximum leakage of 0.05 mW/cm^2 was measured along the sides of the oven control panel. Small amounts of microwave energy were being carried through the oven wiring. The "POWER ON" and "COOK" indicator lights both measured 0.04 mW/cm^2.

5. POSSIBLE HAZARDS RESULTING FROM CONSTRUCTION AND WIRING ERRORS

After the initial leakage measurements were taken, an effort was made to go back through the construction steps in the manual and consider what assembly errors could be made that might be potentially hazardous to the oven user. The areas of particular importance were door construction and interlock wiring and adjustments.

5.1 DOOR CONSTRUCTION

All leakage measurements described in this section were made in accordance with the requirements of the performance standard. A 275-ml water load was placed in the center of the cooking shelf, and microwave leakage was measured with a Narda 8100 instrument at a distance of 5 cm.

(1) Seal Plate Spacers

The seal plate spacers are narrow strips of aluminum with holes punched along their length. They are stacked six-high in a rectangular fashion behind the door seal. As noted previously, holes had not been punched in one of the longer spacer plates, and it was necessary to drill the holes before use. If the kit builder did not have access to a drill, he would have the following alternatives: (a) omit the spacer with no holes or (b) remove one spacer all around, leaving even stacks of five each. Both these alternatives were considered when attempting to construct the door incorrectly.

(a) Leakage with omission of one long spacer plate: One longer spacer plate was removed, leaving one stack of five spacers. The maximum leakage observed was 1.2 mW/cm^2 through the top of the door.

(b) Leakage with even stacks of five spacer plates: Two long and two short spacer plates were removed, leaving even stacks of five each. The maximum leakage observed was 0.12 mW/cm^2 through the top of the door seal.

5.2 INTERLOCK ADJUSTMENTS

(1) Latch Interlock Adjustments

The interlock assembly can be adjusted with the use of slotted mounting holes in the oven cavity. This interlock is of the positive latch type and does not allow any door movement before the interlock switch opens. Hence, the adjustment of the interlock assembly has no direct effect on microwave leakage, only on the physical operation of the latch. In the maximum misadjusted position the door latch will not properly engage the latch roller, the interlock switch will remain open, and the oven will not operate.

(2) Concealed Interlock Switch Adjustments

The second interlock switch is concealed and operates off the left door guide. Maximum misadjustment of this switch will allow the door to open 5/8 inch before opening the circuit.

5.3 INTERLOCK WIRING

The oven is wired in such a manner that the on-off power switch, the concealed interlock switch, the latch interlock switch, and the timer switch are all in series on one side of the line.

(1) Concealed Interlock Switch Wiring

Three wires are connected to the concealed interlock switch. An orange wire carries the current into the switch and, because of its length, can only be connected to the correct lug at the front of the switch. The other end of the switch has two lugs to which a blue and a violet wire can be connected interchangeably. When the wires are connected properly, the incoming orange wire will be effectively connected to the blue wire when the door is closed, and the oven will be allowed to operate. When the door is open, the switch effectively connects the incoming orange wire to the violet wire, lighting the "DOOR OPEN" indicator lamp and opening the circuit to the magnetron.

If the violet and blue wires are reversed on one end of the switch, the opposite actions will take place. The "DOOR OPEN" indicator light will be on when the door is closed, the oven will not operate, and the door, once closed, will not open. When the door is open, the "DOOR OPEN" indicator light will be off, and the interlock switch will be effectively bypassed. If the latch interlock were now defeated, the oven could be operated with the door open.

It is recommended that the push-on type lugs on the violet and blue wires in the wiring harness and on the switch connectors be made different sizes. This would be a very simple solution and would prevent interchanging the violet and blue wires.

An additional note should also be made on the Troubleshooting Chart, p. 55, in the assembly manual. If the "DOOR OPEN" lamp is on when the door is shut, another "possible cause" could be that the interlock switch has been miswired.

(2) Latch Interlock Assembly Wiring

The latch interlock assembly has six wired connections, three on each end of the interlock assembly. Because of the length of the wires, connections cannot be interchanged between the two groups of wires. The three wires in each of the two groups, however, can be interchanged. There is no combination of wiring errors in the two groups of connections that will effectively bypass the interlock. Any incorrect wiring will result in the probable destruction of the electrical components (diodes, SCR, or resistors) in the interlock assembly and make it impossible to open the door.

6. COMPLIANCE WITH THE PERFORMANCE STANDARD FOR MICROWAVE OVENS

The performance standard for microwave ovens[5] became effective October 6, 1970, and is applicable to ovens manufactured after October 6, 1971.

The Heathkit microwave oven appears to meet the requirements that microwave radiation leakage shall not exceed 1 mW/cm^2 at a distance of 5 cm. The ability of the oven to stay within the 5 mW/cm^2 leakage limit over the life of the product could not be determined during these initial laboratory tests. When a life testing program on the oven is completed, more will be known about the deterioration of the door seal components caused by normal wear.

The oven has two safety interlocks, one of which is concealed, and would thus satisfy the interlock requirements in paragraph 78.212(c)(3)(i) of the performance standard.

The oven will not satisfy paragraph 78.212(c)(3)(iv) of the standard concerning the insertion of an object into the oven cavity. A wire inserted through the open screen in the door will cause radiation leakage in excess of 5 mW/cm^2.

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[5]See reference 1, page 1

7. SUMMARY AND RECOMMENDATIONS

The microwave leakage level of the Heathkit oven can be expected to be below 1 mW/cm^2 when the oven is assembled with reasonable care. The actual construction of the kit is not difficult but does require the use of a small power drill.

The oven door will require modification to prevent the insertion of objects into the cavity when the oven is operating in order to meet the requirements of the performance standard for microwave ovens. (Since completion of this study the manufacturer has notified the Division of Electronic Products that an oven door baffle has been designed to prevent the insertion of objects through the ventilation holes in the door. The manufacturer has stated that this modification is being being supplied at no cost to all previous purchasers and will be incorporated in all new ovens.)

The following modifications are recommended:

(1) An easier and more effective method should be devised to attach the oven cavity in the cabinet.

(2) The front panel assembly should be made as flat as possible by the manufacturer, and the builder should not have to be relied upon to straighten it before assembly.

(3) Another method of attaching the front panel assembly to the oven cavity should be investigated.

(4) All dimensions should be given in Detail 9A, page 17, to clarify the length of the vinyl door seal to be removed.

(5) The push-on connectors used on the violet and blue wires of the concealed interlock switch should be differant sizes to prevent miswiring of the switch.

(6) The Troubleshooting Chart, p. 55, should include a statement about the possibility that miswiring the interlock switch could cause the "DOOR OPEN" light to be on when the door is closed.

(7) The instruction manual should provide more warnings in the sections on door construction and interlock installation and wiring, cautioning the builder to be especially careful to follow instructions explicitly, because proper assembly of these items is important for the safe operation of the oven.

The strongest warnings on the hazards of microwave radiation are presented in the "OPERATION" section of the manual, p. 52, which is normally read after the oven is completely assembled. Warnings of this type should also be included in the introductory remarks so the builder will be informed of the possible hazards of microwave radiation before construction begins.

APPENDIX A

LETTER FROM MANUFACTURER

16

HEATH COMPANY

BENTON HARBOR, MICHIGAN

E. C. FIEBICH
VICE PRESIDENT-ENGINEERING

February 11, 1971

Dr. Robert L. Elder, Director
Department of Health, Education, and Welfare
Division of Electronic Products
Bureau of Radiological Health
Rockville, Maryland 20852

Dear Dr. Elder:

Thank you for the opportunity to review the draft of your Technical Bulletin covering construction of the Heathkit Electronic Oven. Some relatively minor notations have been made on Pages 2, 3 and 5.

The Bulletin has been reviewed by the Engineering Department design responsible group and the following represents overall comments.

In respect to the summary and recommendation section.....Heath Engineering is presently designing an oven door baffle to prevent the insertion of objects through the ventilation holes. The basic approach and operational philosophy has been formally transmitted to your office for review and comment as part of our effort to meet the October 6, 1971 Microwave Oven Standard deadline.

The following comments are in response to the numbered recommendations appearing on Pages 13 and 14 of the Report:

(1) The top 3 holes of the cabinet were out of tolerance 1/16" in the first production run (from which the HEW sample was obtained). The print was subsequently changed and an overage of sheet metal screws were provided to assure adequate fastening. We will investigate further the use of machine screws and nuts for this assembly in future models.

(2) A flatness specification for the front panel is now on the print. The instructions are intended to check against any possible shipping damage or stress relief damage. It was our intent to provide an additional customer conducted inspection at this point of assembly to assure the best door seal possible.

(3) During development of the oven, machine screws and nuts for fastening the front panel to the oven cavity were considered. The inside edge of the chamber flange is a blind area, precluding the use of standard nuts. Thus, the number of fastening holes were increased, using sheet metal screws. We will, however, investigate the use of captive nuts along this flange together with conventional screw/nut fasteners on the three other flanges. We have had no field complaints regarding misalignment of hinge/panel holes. The need to redrill these

holes can only be attributed to a manufacturing error, resulting in parts out of tolerance. Certainly something to watch for closely in our QC.

(4) The length of vinyl door seal to be removed is not shown. We will be changing the next printing of manuals to indicate the exact length to be cut.

(5) Different size switch terminals and mating connectors are being investigated to eliminate the possibility of interchanging the blue and violet wires. In addition, a tab attached to the switch arm is being considered to allow greater striking area for the door guide.

(6) There is a section in the Troubleshooting Chart concerned with the DOOR OPEN light. We will include miswiring of the interlock switch as a possible cause.

(7) At the present time we are supplying construction manuals with the green insert sheet pasted to the inside of the front cover. We will be writing a special section concerning microwave radiation safety considerations and the need for care in assembly. This section would precede actual assembly. Also, additional warnings are being considered for preceding each critical assembly in the manual. Such warnings might read, "The assembly procedures covered in the next five steps are critical to proper and safe operation of the oven. Take special care in performing these steps." We will thoroughly review the manual to identify these specific areas.

ADDITIONAL COMMENT - Refer to (6) on Page 6. The plate with the missing holes was a most unusual occurrence but does illustrate the possibility. We will investigate a one-piece cast spacer which would eliminate the individual plates altogether. The assembly of the plates would definitely be a critical assembly step and would receive a preceding warning, as described above. In addition, a comment could be added, "If you have any difficulty in assembling these spacers, do not proceed. Contact the Technical Consulting group at Heath Company for advisement."

Refer to 4.1, Page 7. The only way the oven could be operated with the door open is to deliberately defeat the interlock or have a faulty interlock assembly and interchange the blue and violet wires on the concealed microswitch. The change to different sized microswitch terminals would make an accidental interchange of wires impossible.

In retrospect, the GD-29 Microwave Oven kit was moving smoothly through Engineering and Manual into production. After the initial

kit production run, a complete hold was put on the product. During this period, each Heathkit Electronic Center received a token shipment. My personal feeling is that your experience represents a perfect application of Murphy's Law in respect to the door hole hinge alignment and the missing holes in a long spacer plate. It is our usual practice to constantly refine Heathkit products after they are released, including making whatever changes that might simplify interpretation and assembly.

Of course, we will have to be cognizant of the need to submit change information to FCC prior to implementing the change in order to preserve the integrity of our Type Approval.

Thank you again for an opportunity to comment on this Report. I am particularly elated at the results of your microwave leakage measurements.

Yours very truly,

E. C. Fiebich

E. C. Fiebich

ECF/mcl

The ABSTRACT CARDS below are designed to facilitate document retrieval using Coordinate Indexing. They provide space for an accession number (to be filled in by the user), suggested keywords, bibliographic information, and an abstract.

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William Kanne, Jr.
CONSTRUCTION AND EVALUATION OF A KIT-FORM MICROWAVE OVEN

Accession No.

U.S. Department of Health, Education, and Welfare, Public Health Service, Bureau of Radiological Health Publication No. BRH/DEP 71-7 (May 1971), 18 pp. (limited distribution).

ABSTRACT: A Heathkit® model GD-29 microwave oven was purchased and assembled in accordance with the manual supplied with the kit. As construction progressed, problem areas were observed and recorded. Most assembly problems were of a mechanical nature. After the oven was assembled, microwave leakage was observed to be less than 1 mW/cm^2. The possibility of hazards caused by errors in construction and wiring were investigated in

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the areas of door construction, interlock adjustments, and interlock wiring. The oven which was assembled will not comply with the performance standard for microwave ovens which will become effective October 6, 1971, primarily because objects can be inserted through the open screen in the door and the resulting leakage is in excess of 5 mW/cm^2. (The Heath Company has recently designed a door baffle which prevents insertion of objects through the door screen). A list of recommended modifications is presented.

KEYWORDS: Kit-form Microwave Oven; Microwave Oven Assembly; Microwave Oven Radiation Leakage; Microwave Oven Safety.

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DIVISION OF ELECTRONIC PRODUCTS

Technical Reports

(continued from inside of front cover)

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